SAS output for Hierarchical Linear Models

Unconditional Random Intercept Model

$$MATHACH_{ij} = \gamma_{00} + u_{0j} + r_{ij}$$

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr > Z
Intercept	SCHOOL	8.6097	1.0778	7.99	<.0001
Residual		39.1487	0.6607	59.26	<.0001

Fit Statistics

-2 Res Log Likelihood	47116.8
AIC (smaller is better)	47120.8
AICC (smaller is better)	47120.8
BIC (smaller is better)	47126.9

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	12.6370	0.2443	159	51.72	<.0001

Random Intercept Model with a level 2 predictor

$$MATHACH_{ij} = \gamma_{00} + \gamma_{01}(MEANSES) + u_{0j} + r_{ij}$$

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr > Z
Intercept	SCHOOL	2.6357	0.4036	6.53	<.0001
Residual		39.1578	0.6608	59.26	<.0001

Fit Statistics

-2 Res Log Likelihood	46961.3
AIC (smaller is better)	46965.3
AICC (smaller is better)	46965.3
BIC (smaller is better)	46971.4

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	12.6495	0.1492	158	84.77	<.0001
MEANSES	5.8635	0.3613	158	16.23	<.0001

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
MEANSES	1	158	263.37	<.0001

Random-coefficient Model with a Level 1 predictor

The Mixed Procedure

$$MATHACH_{ij} = \gamma_{00} + \gamma_{10}(SES - MEANSES) + u_{0j} + u_{1j}(SES - MEANSES) + r_{ij}$$

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	SCHOOL	8.6769	1.0786	8.04	<.0001
UN(2,1)	SCHOOL	0.05075	0.4062	0.12	0.9006
UN(2,2)	SCHOOL	0.6940	0.2808	2.47	0.0067
Residual		36.7006	0.6258	58.65	<.0001

Fit Statistics

-2 Res Log Likelihood	46714.2
AIC (smaller is better)	46722.2
AICC (smaller is better)	46722.2
BIC (smaller is better)	46734.5

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
3	1065.70	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	12.6493	0.2445	159	51.75	<.0001
cses	2.1932	0.1283	7024	17.10	<.0001

Random-coefficient Model with predictors from two different levels

$$MATHACH_{ij} = \gamma_{00} + \gamma_{01}(MEANSES) + \gamma_{02}(SECTOR) + \gamma_{10}(SES - MEANSES) + \gamma_{11}(MEANSES)^*(SES - MEANSES) + \gamma_{12}(SECTOR)^*(SES - MEANSES) + u_{0j} + u_{1j}(SES-MEANSES) + r_{ij}$$

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	SCHOOL	2.3817	0.3717	6.41	<.0001
UN(2,1)	SCHOOL	0.1926	0.2045	0.94	0.3464
UN(2,2)	SCHOOL	0.1014	0.2138	0.47	0.3177
Residual		36.7212	0.6261	58.65	<.0001

Fit Statistics

-2 Res Log Likelihood	46503.7
AIC (smaller is better)	46511.7
AICC (smaller is better)	46511.7
BIC (smaller is better)	46524.0

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
3	220.57	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	12.1136	0.1988	157	60.93	<.0001
MEANSES	5.3391	0.3693	157	14.46	<.0001
SECTOR	1.2167	0.3064	157	3.97	0.0001
cses	2.9388	0.1551	7022	18.95	<.0001
MEANSES*cses	1.0389	0.2989	7022	3.48	0.0005
SECTOR*cses	-1.6426	0.2398	7022	-6.85	<.0001

Unconditional Growth Curve Model without predictors

$$Y_{ij}=[b_{00} + b_{10}TIME_{ij}] + [u_{0j} + u_{1j}TIME_{ij} + r_{ij}]$$

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	**id**	1198.78	318.38	3.77	<.0001
UN(2,1)	**id**	-179.26	88.9634	-2.01	0.0439
UN(2,2)	**id**	132.40	40.2107	3.29	0.0005
Residual		159.48	26.9566	5.92	<.0001

Fit Statistics

-2 Res Log Likelihood	1266.8
AIC (smaller is better)	1274.8
AICC (smaller is better)	1275.1
BIC (smaller is better)	1281.0

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
3	120.90	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	164.37	6.1188	34	26.86	<.0001
time	26.9600	2.1666	104	12.44	<.0001

Growth Curve Model with a level 1 predictor

The Mixed Procedure

$$Y_{ij}=b_{00} + b_{10}(TIME)_{ij} + b_{01}(COVAR)_{ij} + b_{11}(COVAR)(TIME)_{ij} + u_{0j} + u_{1j}(TIME)_{ij} + r_{ij}$$

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	**id**	1236.41	332.40	3.72	<.0001
UN(2,1)	**id**	-178.23	85.4298	-2.09	0.0370
UN(2,2)	**id**	107.25	34.6767	3.09	0.0010
Residual		159.48	26.9566	5.92	<.0001

Fit Statistics

-2 Res Log Likelihood	1260.3
AIC (smaller is better)	1268.3
AICC (smaller is better)	1268.6
BIC (smaller is better)	1274.5

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
3	120.72	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	164.37	6.2061	33	26.49	<.0001
time	26.9600	1.9939	103	13.52	<.0001
ccovar	-0.1136	0.5040	33	-0.23	0.8231
time*ccovar	0.4329	0.1619	103	2.67	0.0087